F-8073

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Rolf QUAST
Serial No.	:	10/766,585
Filed	:	January 27, 2004
For	:	PUMP FOR PUMPING OIL FROM DEEP WELLS
Group Art Unit	:	UNKNOWN
Examiner	:	UNKNOWN

DECLARATION OF TRANSLATOR

I, Walter Herzberg, declare and say:

My address is: 5-21 Elizabeth Street, Fair Lawn, N.J. 07410.

I speak and write English and German.

I have prepared the attached translation from German into English of the German Language Patent Application filed in the U.S. Patent and Trademark Office on January 27, 2004.

I hereby certify that the attached translation is a true, exact, and accurate translation of the aforesaid document.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Walter Herzberg

Walter Herzberg

May 14, 2004

Date

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PUMP FOR PUMPING OIL FROM THE DEEP WELLS

The invention relates to a pound for pumping liquids, especially oil from deep wells with a screw pump driven by a submersible motor.

Generally, oil is pumped from on-shore exploration from drilled boreholes with a clear width of 4.5", 5.5" and 7". The pump operating head may to amount up to 1000 m. This, in turn, requires pumps, which, on the one hand can be supplied in constructions that can be incorporated in these narrow boreholes and, on the other, are able to produce the respective pump-operating heads. Up until now, eccentric screw pumps and multistep high-pressure rotary pumps were used for this purpose. Both have service life and efficiency disadvantages. Eccentric screw pumps can hardly supply satisfactory service life intervals over expensive stators. In the case of high-pressure rotary pumps, the installed width for appropriate efficiencies by means of blade wheels constructed with an optimum diameter cannot be achieved. In both systems, the high operating temperatures of 150° to 290°C, existing at the respective drilled depths, are a further difficulty.

The use of a classical screw pump of the usual type fails, on the one hand, because the pumping output is too low, and on the other, because of the problem

of the destruction of the pumps by wear particles, such as sand or the like, present in oil that is to be pumped.

This is also the case for a pump, described in US 4,623,305, since the horseshoe thrust bearing and the balance piston for the idler screw would inevitably be destroyed by any contaminated oil (sand).

Correspondingly, the same is also true for US 2,100,560 using a screw spindle diving mechanism as driving motor. Furthermore, in the case the previously known pumps, there is the fact that the power density, that is, the pumping output in relation to the volume, is limited owing to the fact that only the central spindle acts as a screw-shaped rotor, whereas the satellite spindles are only sealing spindles.

It is therefore an object of the invention to design a pump of the above-mentioned type, so that, during appropriate operating times, possibly contaminated oil can be pumped at high operating temperatures from great drilling depth and at the same time, an increased power density can be achieved.

Pursuant to the invention, this objective is accomplished by a pump, which is provided with a screw pump driven by a submersible motor, the driving spindle being constructed as a sealing spindle, to which several, preferably three screw-

shaped rotors are assigned and, for intercepting the axial thrust, hydraulic supporting bearings are disposed on the conveying elements, on the suction side and are connected over bypass pipelines with the pressure side, the inlet openings of which are safeguarded against wear particles by a screen.

The inventive construction results, on the one hand, in a quite high pump performance, because three screw-shaped rotors and only one sealing spindle are provided and, not as previously, one screw-shaped rotor and, for example, three sealing spindles. On the other hand, there is also a constant flushing with purified oil, which passes over the bypass pipelines from the pressure side to the suction side into the hydraulic supporting bearings, as well as an additional flushing of the conveying gap, so that abrasive grinding materials, such as grains of sand or the like, which are transported along with the pumped oil, cannot interfere too much with the operation.

In a further development of the invention, the screw-shaped rotors can discharge into an expanded pressure space, in the peripheral wall of which, covered with a filter, the inlet openings of the bypass pipelines are disposed. Preferably, the pressure space may have an essentially triangular cross section with rounded corners embracing the screw-shaped rotors.

In this expanded pressure space, sufficient turbulence is developed to ensure

that, when oil flows over the pressure return with the bypass pipelines from the pressure side to the suction side and the hydraulic supporting bearings, the wear particles, which remain hanging at the filter, are removed once again by this turbulent flow and carried along, so that the these wear particles are pumped upward with the oil.

The expanded pressure space can be connected over axial boreholes with the connecting space to the conveying riser.

In accordance with a further embodiment of the invention, the inner surface of the housing of the screw pump is to have a wear-resistant surface such as that, provided, for example, by a wear-resistant coating.

Finally, it is also still within the scope of the invention, that the housing of the screw pump on the suction side has one lateral suction inlet opening per screw-shaped rotor.

Further advantages, distinguishing features and details of the invention arise out of the following description of an example, as well as from the drawing, in which

Figure 1 shows a longitudinal section through an inventive pump and

Figure 2 shows a cross section along the line II-II in Figure 1.

The inventive pump consists of a screw pump 1 with a submersible motor, which is connected at the suction side. In the example shown, only the motor flange 2 is indicated. The screw pump housing 3 has a driving spindle 4, which is formed centrally as a sealing spindle and is surrounded by three screw-shaped rotors 5. The inner surface 6 of the housing of the screw pump 1 is provided with a surface, which protects against wear, such as a wear-resistant coating 7.

For intercepting the axial thrust on the pumping elements, that is, the screw-shaped rotors 5, hydraulic support bearings 8 are provided, which are connected at over bypass pipelines 9 with the pressure side of the screw pump 1. In the example shown, an expanded pressure space 10 is provided at this pressure side and formed by a corresponding bore of the housing 3. The essentially triangular cross-sectional shape of this expanded pressure space with rounded corners, embracing the screw-shaped rotors 5, can be seen in Figure 2. The whole of the inner surface of this expanded pressure space can be covered with a filter 11, which covers the inlet openings 12 to the bypass pipelines 9, so that the return of the oil under pressure is protected and the oil, returned to the hydraulic supporting bearing 8, is cleaned. This prevents not only a clogging of the hydraulic supporting bearings themselves, but also, additionally, it bring about a flushing of the gap of the screw pump by this cleaned oil, so that the service life of the

inventive pump is prolonged.

The expanded pressure space 10 is connected over boreholes 13 with the connecting space 14 to the conveying riser 15.

Three suction inlet openings for aspirating the oil, which is usually mixed with impurities, can be seen at 16.